

Energy Imbalance: The End of the World as We Know It

CPCP Colloquium

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University of South Carolina

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Why Is Energy Imbalance the End of the World?

➤ **It Causes Obesity**

Do We Have an Obesity Epidemic?

- Absolutely, but I am not going to show you the obesity maps to prove it!
- 1/3rd of Americans are obese & 1/3rd are OW
 - If we used the correct classification for overweight (BMI >22.0 to 29.9) the rates would be even more astonishing!
- What are the health problems caused by obesity?
 - Everything—on Sept 10, 2012 NPR had a story on kidney stones and obesity!
 - Dec 24, 2012—early puberty caused by obesity!
 - The next major problem to be disclosed is:
 - **Terrorism**

Causes of the Obesity Epidemic

**Too Many People Being in
Positive Caloric Balance
on too Many Days**

Confusion about Overweight, Obesity and Health

State obesity rates could skyrocket by 2030

USA Today, September 19, 2012

- **About two-thirds of adults in Mississippi and several other states will be obese by 2030 if obesity rates continue to climb as they are now, an analysis reports today.**
- **The prediction says that 13 states will have adult obesity rates over 60%; all 50 states would have rates above 44%.**
- **The words “physical activity” did appear once in the article**

Obesity and Diabetes

- We hear a great deal, in both the scientific literature and popular press, about the epidemics of obesity and diabetes
- In fact, some even use the term “diabesity”

BMJ

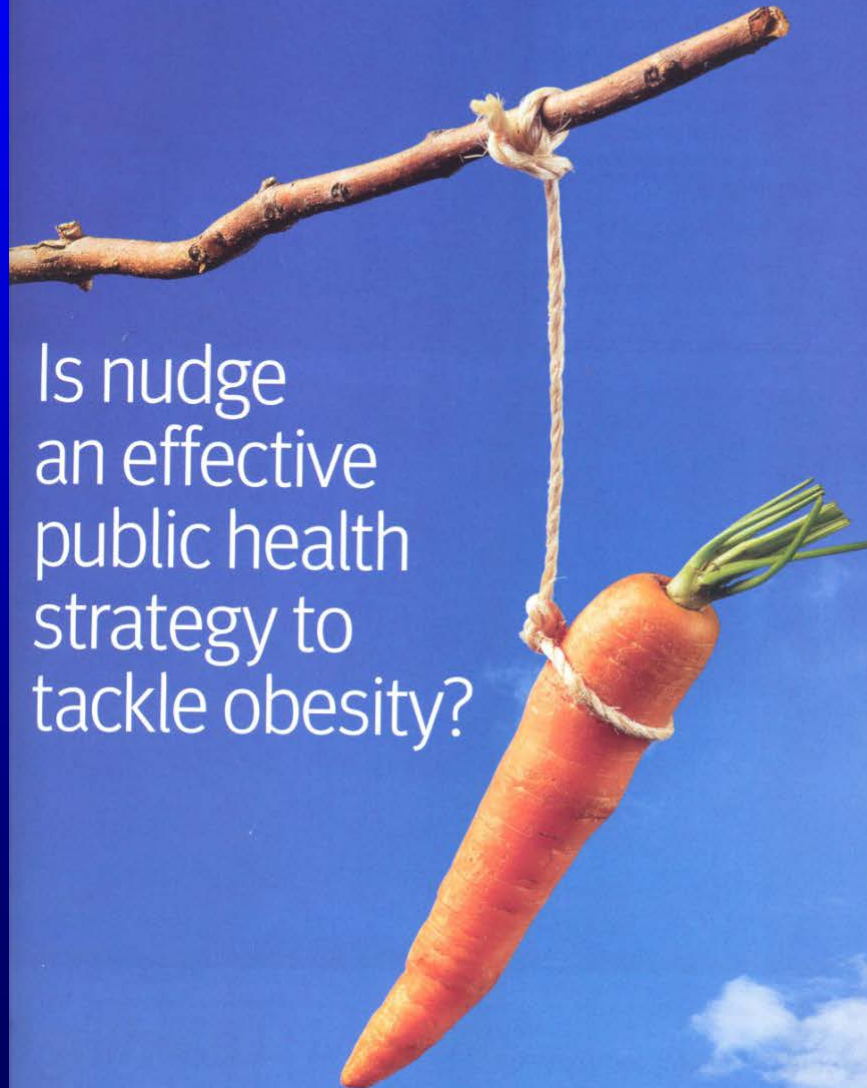
342:883-932 No 7803 ISSN 1759-2151
23 April 2011 | bmj.com

PLUS Predicting pre-eclampsia

Artificial pancreas for type 1 diabetes

How to manage "diabesity"

Putting evidence into practice



Is nudge
an effective
public health
strategy to
tackle obesity?

Obesity and Diabetes

- What is the rate of type 2 diabetes in U.S. individuals under 45 years of age?

U.S. Rates of Diagnosed Type 2 Diabetes in Persons under 45 Years of Age in 2010

➤ **1.4%**

➤ **Of course this is higher than it was in 1980**

➤ **0.6%**

➤ **Diagnosed diabetes in those under 20 years of age in the U.S.**

➤ **0.26%**

Causes of the Obesity Epidemic



World Health Organization

Collaborating Centre for Obesity Prevention

➤ “Increased energy intake alone virtually explains all the increase in body weight in the United States from the 1970s to the 2000s.”

➤ Swinburn B. European Congress on Obesity; May 6-9, 2009; Amsterdam, the Netherlands.



Unsupported Statements

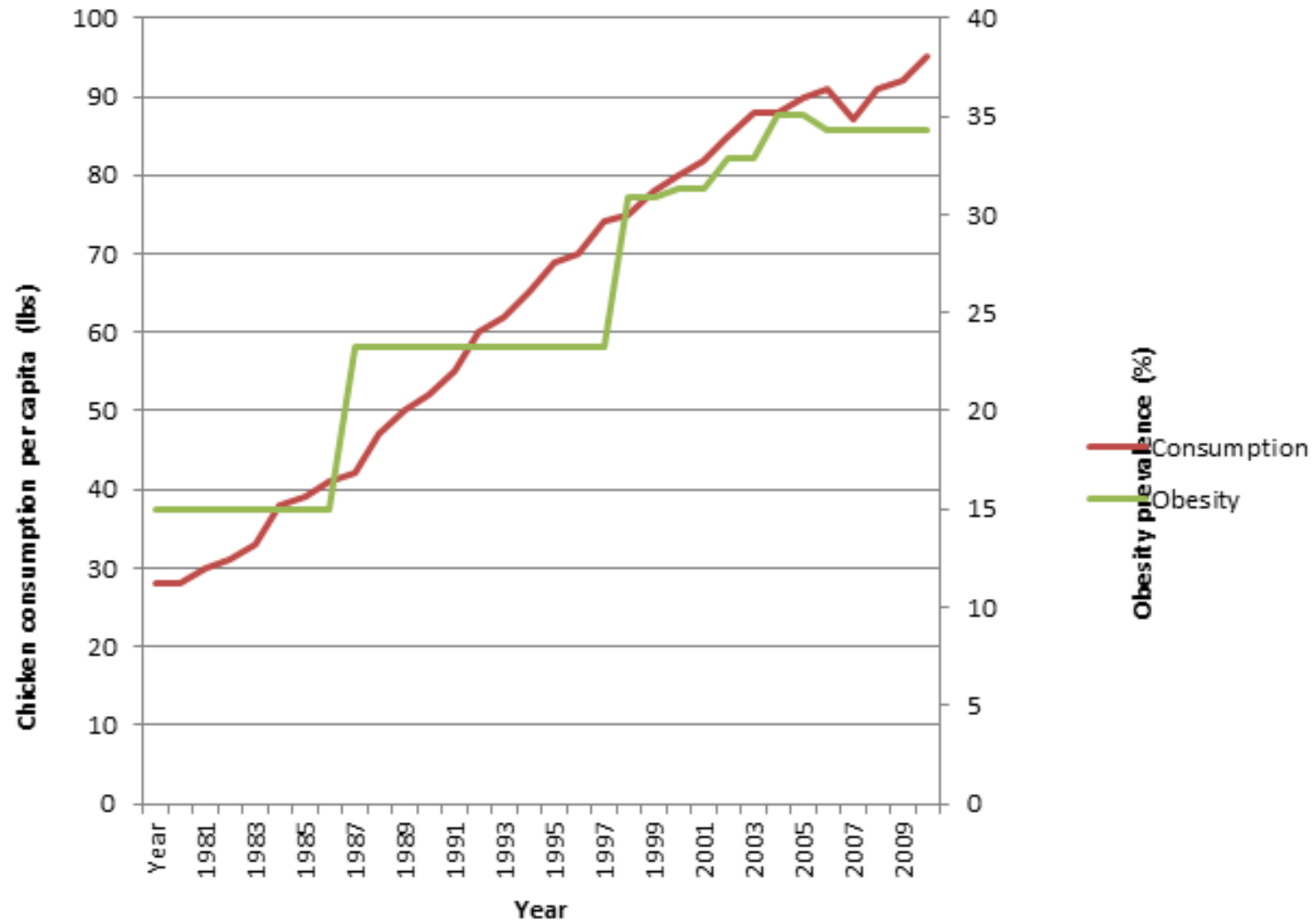
➤ "The main cause of the obesity epidemic in this country is the wide availability of high-caloric foods and the fact that we are eating way too many calories in the course of a day."

➤ Spokesperson for the American College of Cardiology M. Sorrentino, MD. University of Chicago.

➤ Accessed 10/30/2011 from:

<http://www.theheart.org/article/970183/print.do>

Chicken Causes Obesity!



Slide courtesy of Dr. Tim Church

\$27.89

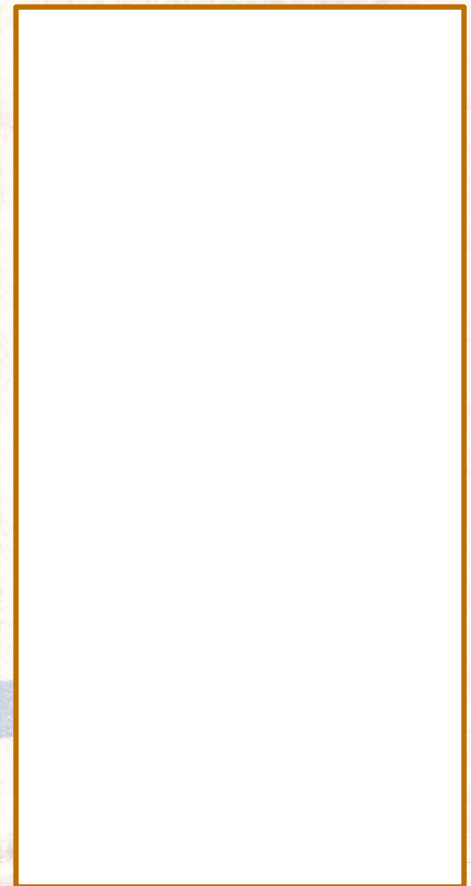
- 2 Big Macs
- 1 cheeseburger
- 1 6-pc. Chicken McNuggets
- 2 medium fries
- 2 small fries
- 2 medium Cokes
- 2 small Cokes

Nutrition facts per person

Chicken, Potatoes and Salad for Four

\$13.78

A savings of \$14.11,
or 51%, over the
McDonald's meal.
Prices per item:



**Comparison Shopping:
McDonald's for Four**

\$27.89



- 2 Big Macs
- 1 cheeseburger
- 1 6-pc. Chicken McNuggets
- 2 medium fries
- 2 small fries
- 2 medium Cokes
- 2 small Cokes

Nutrition facts per person

CALORIES	900 (average)
FAT	37 grams
CARBOHYDRATES	123 grams
PROTEIN	23 grams

Chicken, Potatoes and Salad for Four

\$13.78

A savings of \$14.11,
or 51%, over the
McDonald's meal.
Prices per item:



Nutrition facts per person and difference from McDonald's meal



CALORIES	934
+4%	
FAT	39 grams
+5%	
CARBOHYDRATES	80 grams
-35%	
PROTEIN	67 grams
+191%	

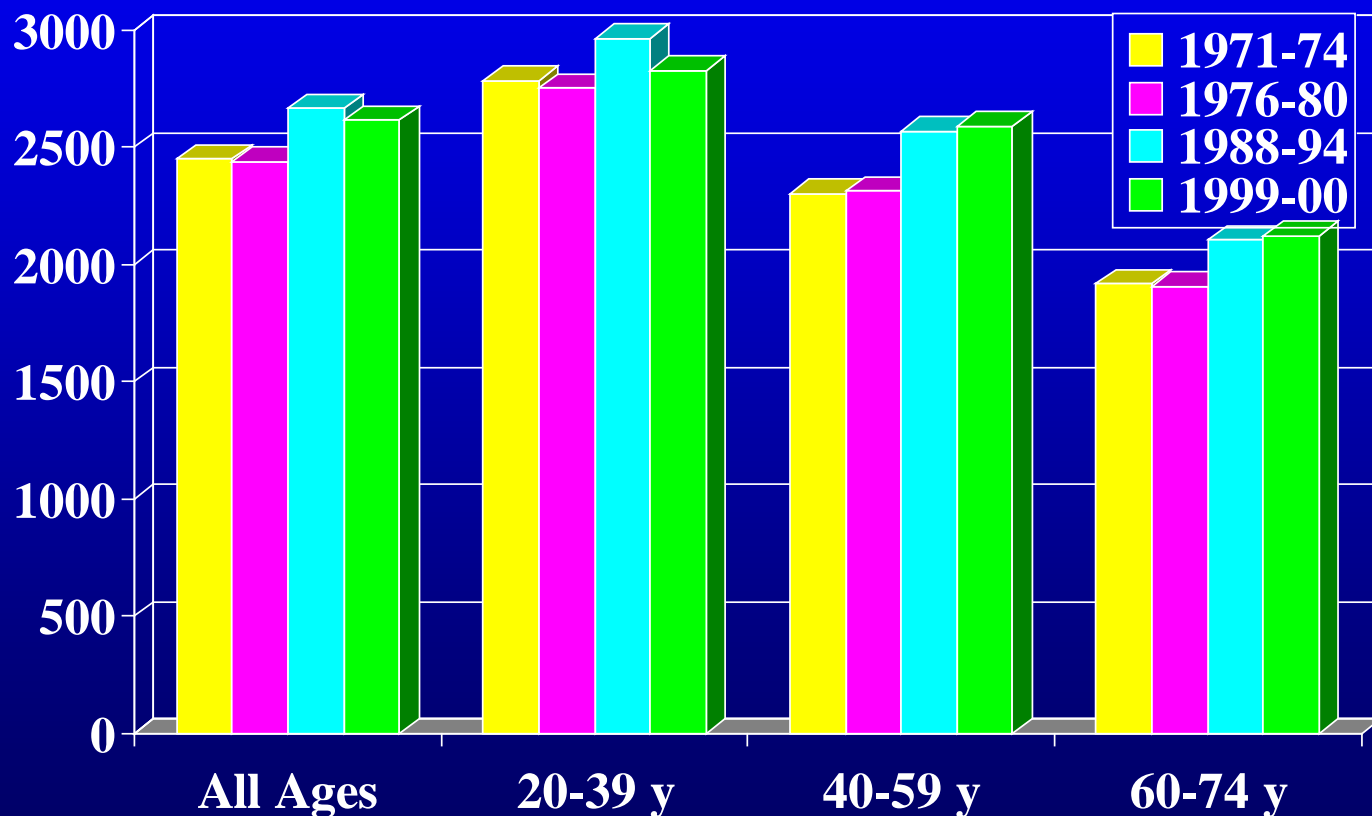
Trends in Energy Intake

NHANES 1971-2000

- **NHANES I—1971-1974**
- **NHANES II—1976-1980**
- **NHANES III—1988-1994**
- **NHANES—1999-2000**
- **Surveys were representative samples of noninstitutionalized U.S. women and men aged 20 to 74 years**

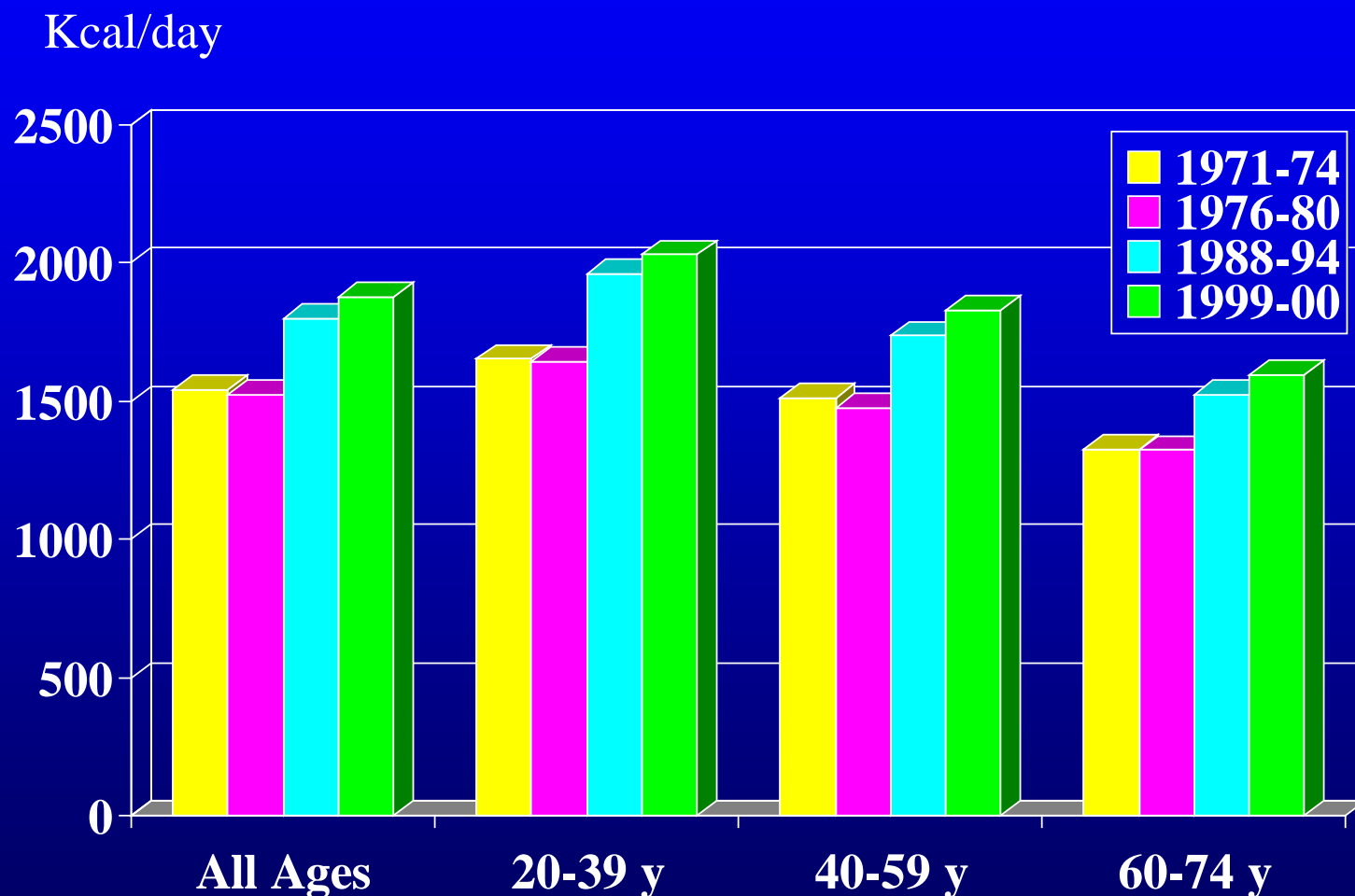
Trends in Energy Intake: 1971 to 2000, Men, NHANES

Kcal/day



Source: *MMWR* Feb 6, 2004

Trends in Energy Intake: 1971 to 2000, Women, NHANES



Source: *MMWR* Feb 6, 2004

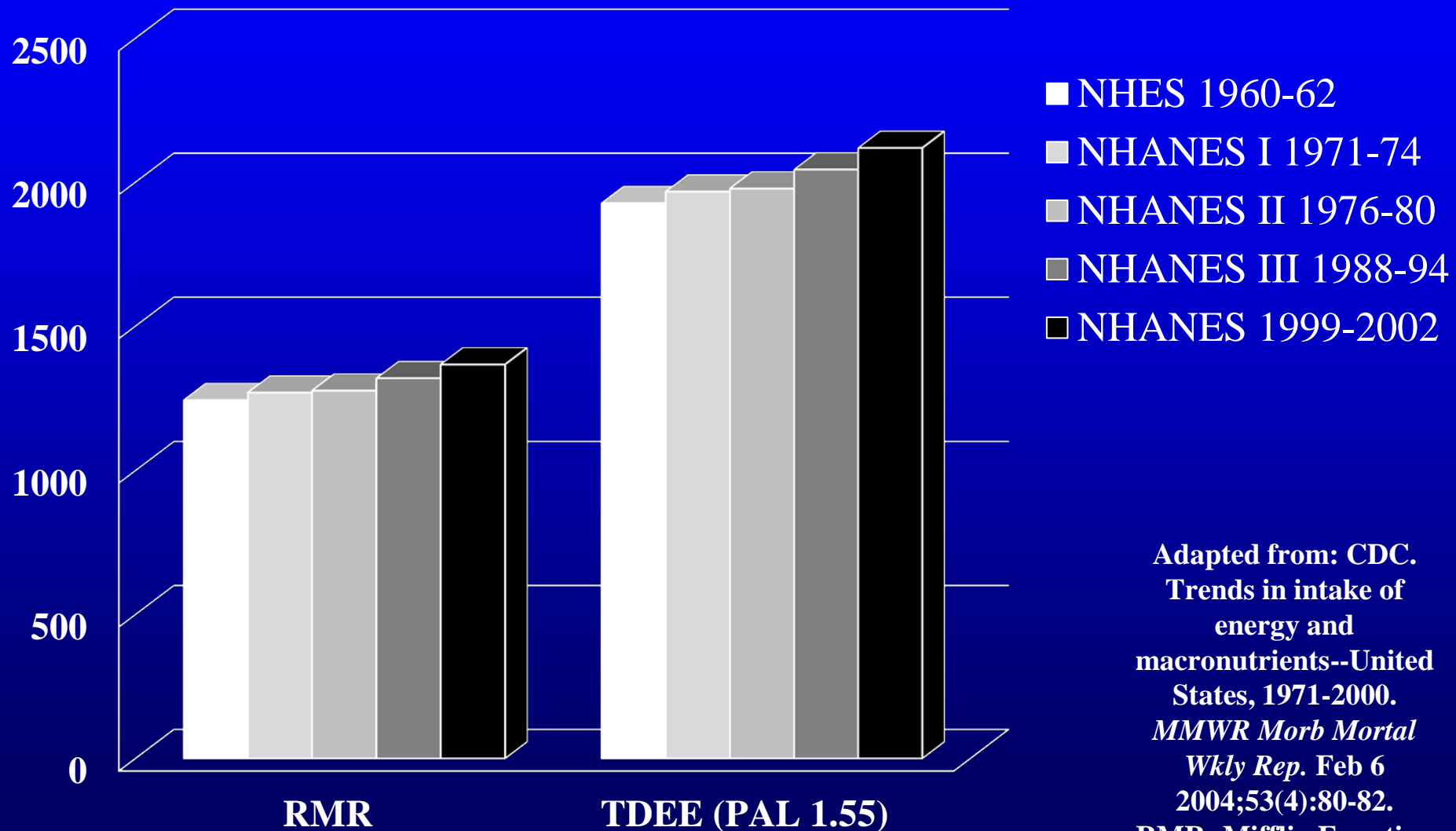
NHANES Survey Methods

1971-2000

- **NHANES I and NHANES II**
 - **24-hour dietary recall, Monday-Friday**
- **NHANES III and NHANES**
 - **24-hour dietary recall, Monday-Sunday**
- **Other changes in methodology included better probing techniques and better training of interviewers**
- **Other changes in dietary behavior included more meals eaten away from home and increasing portion sizes**

Changes in RMR & TDEE

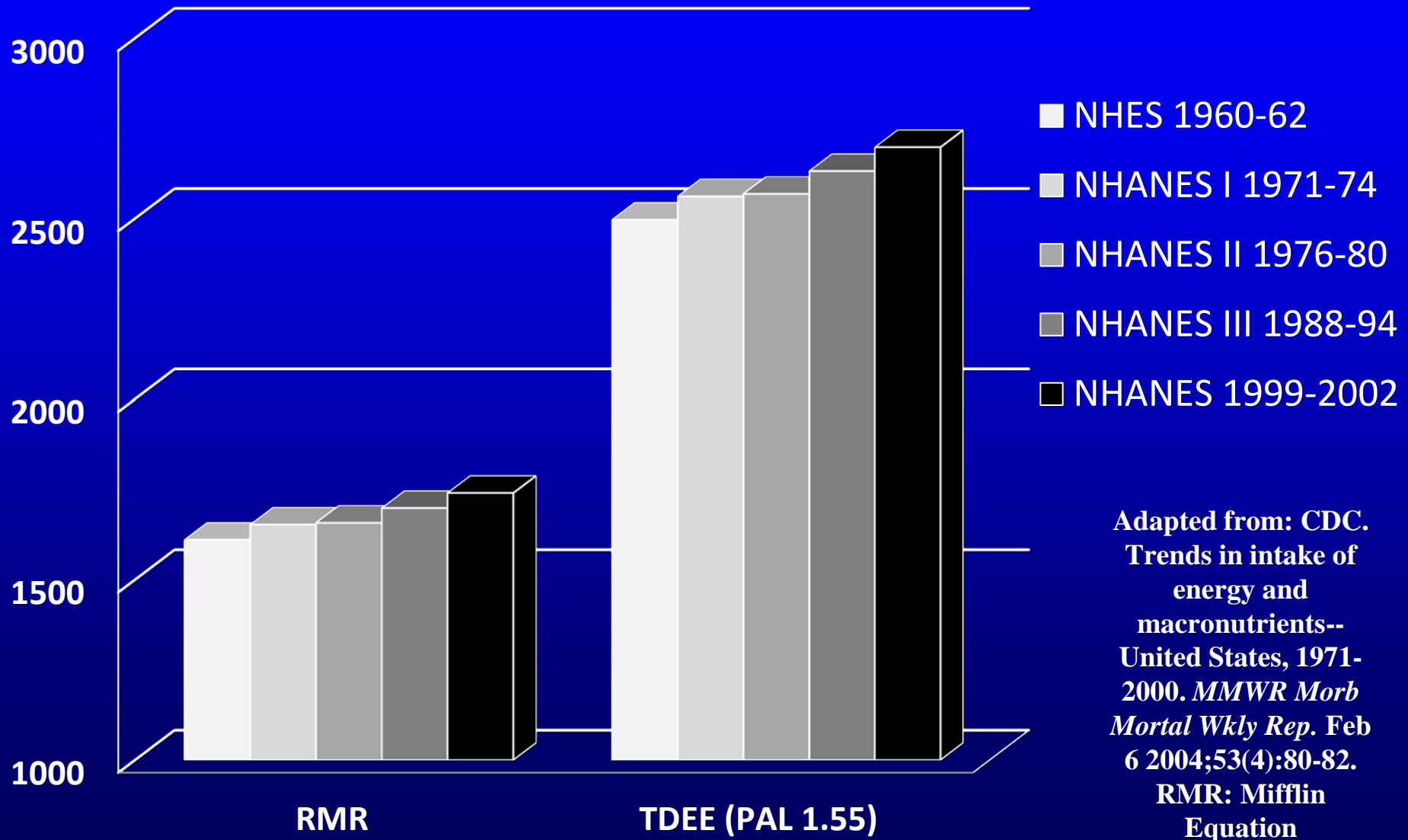
1960-2000: Women 20-74



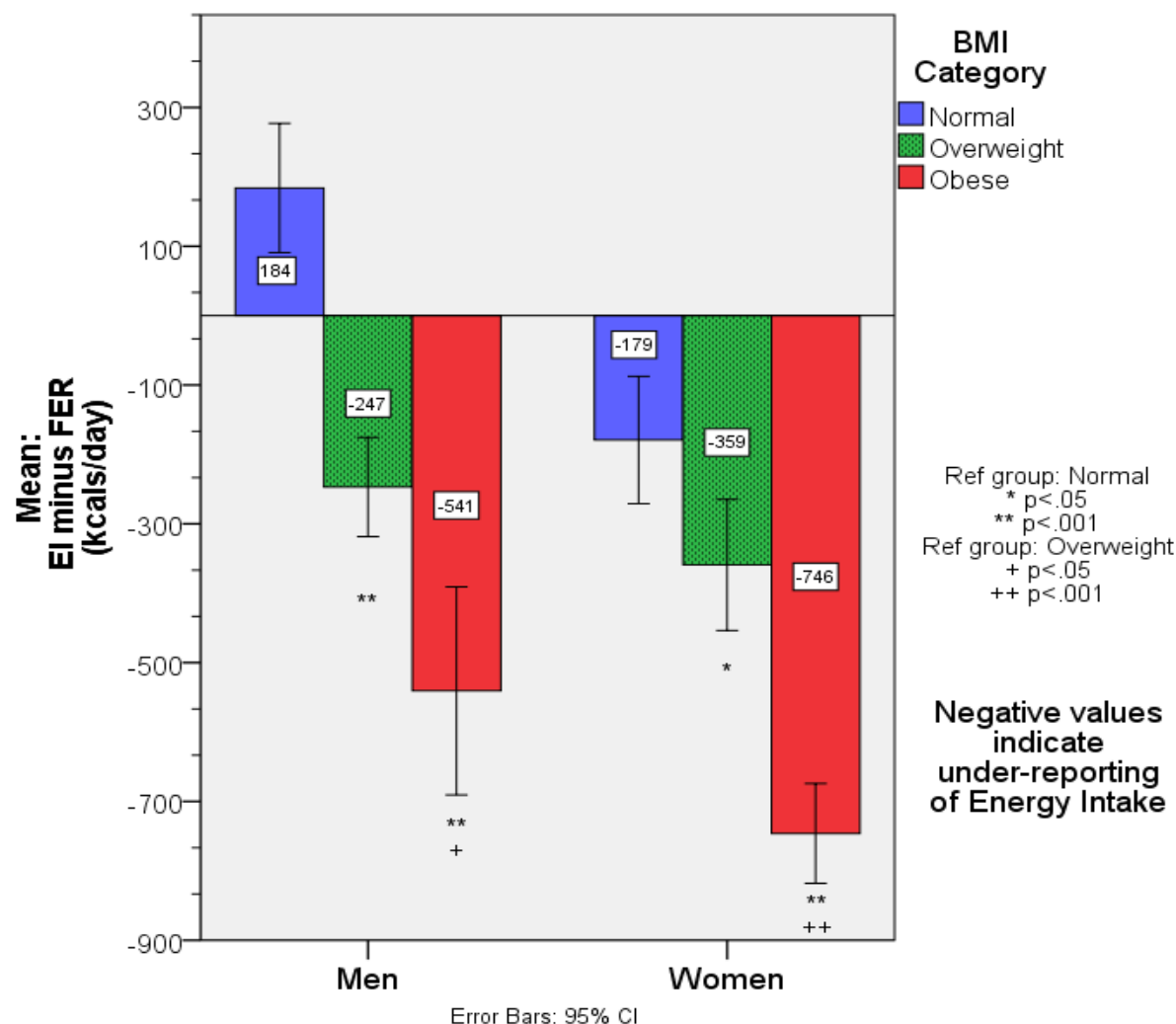
Adapted from: CDC.
Trends in intake of
energy and
macronutrients--United
States, 1971-2000.
MMWR Morb Mortal
Wkly Rep. Feb 6
2004;53(4):80-82.
RMR: Mifflin Equation

Changes in RMR & TDEE

1960-2000: Men 20-74



The Disparity between Reported Energy Intake (EI) and Food Energy Requirements (FERs)



US Adults: 20-74yrs, 2005-2006

**Archer et al.,
Obesity and the
Disparity
between
Reported Energy
Intake and
Actual Food
Energy
Requirements. In
Review.**

True Cause of the Obesity Epidemic



Slide courtesy of Dr. I-Min Lee

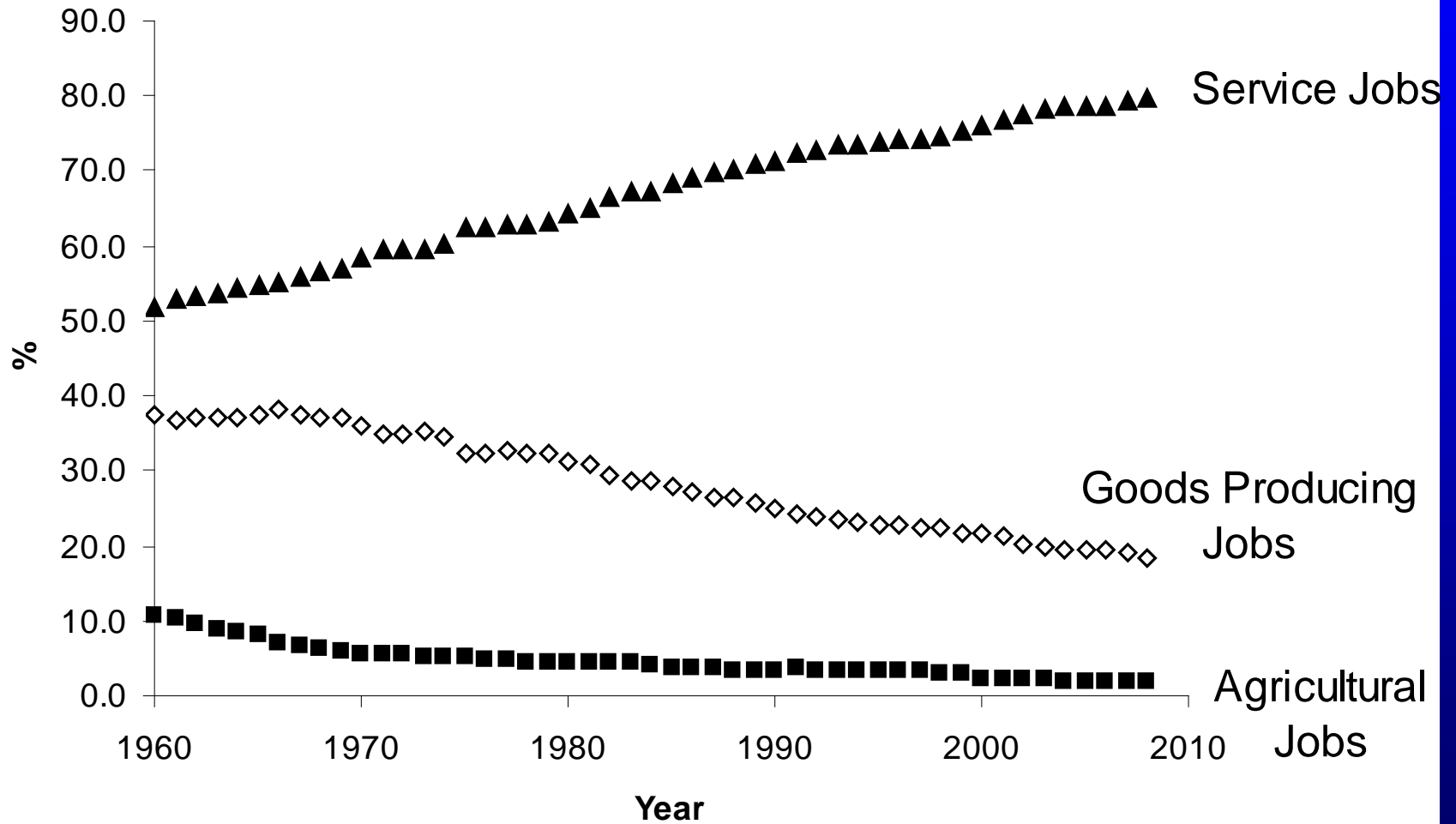
Obesity Epidemic Caused by Eating too Much, Claims Academic

- **Average caloric expenditure in 1980**
 - **Women=950 kcal/day**
 - **Men=1380 kcal/day**
- **Average caloric intake is now 3,500 kcal/day**
- **“Over the past 25 years...there has been no change in our levels of physical activity”**
“there has been no change in energy expenditure”

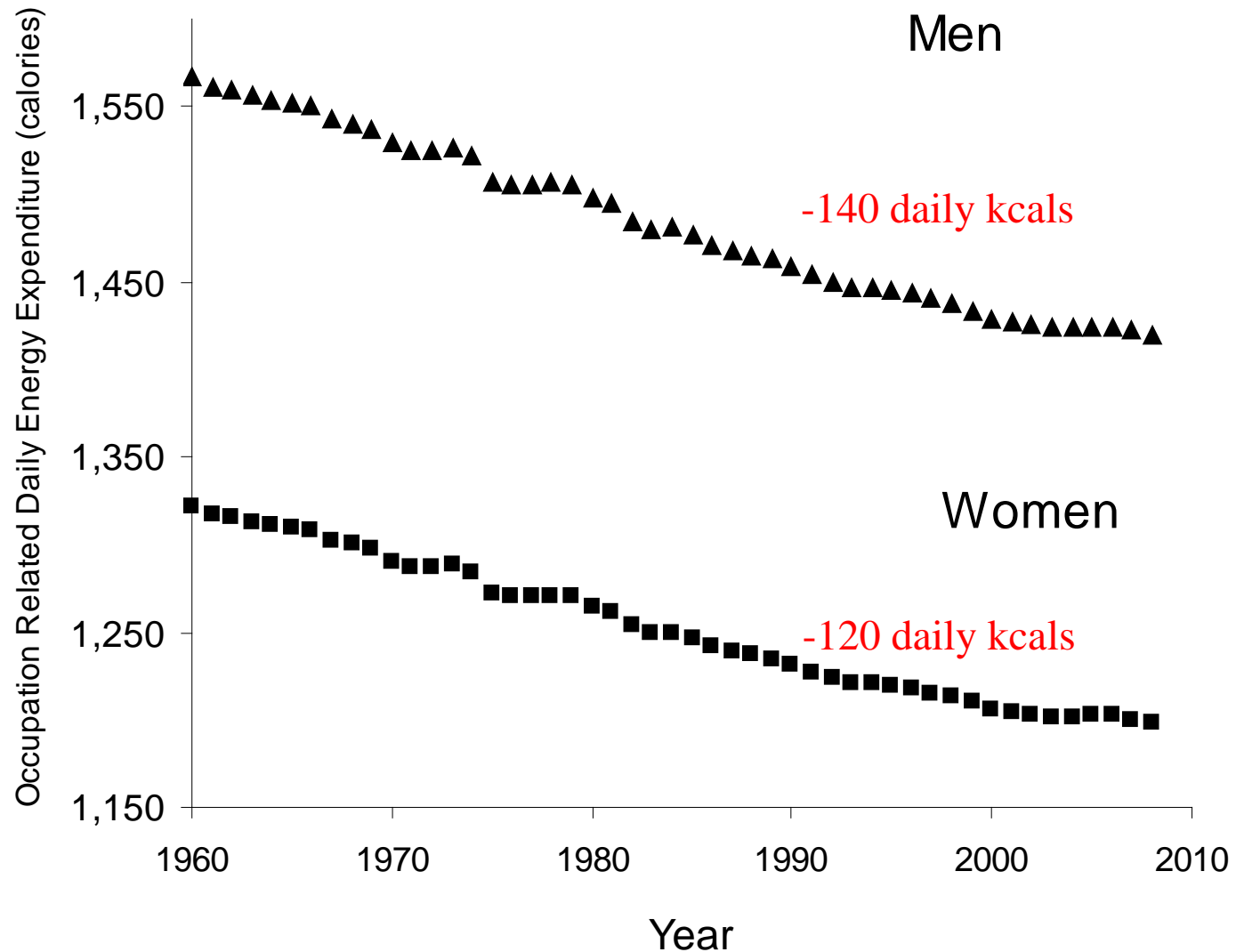
Article on British Science Festival in the September 16, 2010 Daily Telegraph

**Self-Reported Leisure Time
Physical Activity Is Not a Good
Measure of Total Energy
Expenditure**

Jobs in U.S. Over Last 50 Years

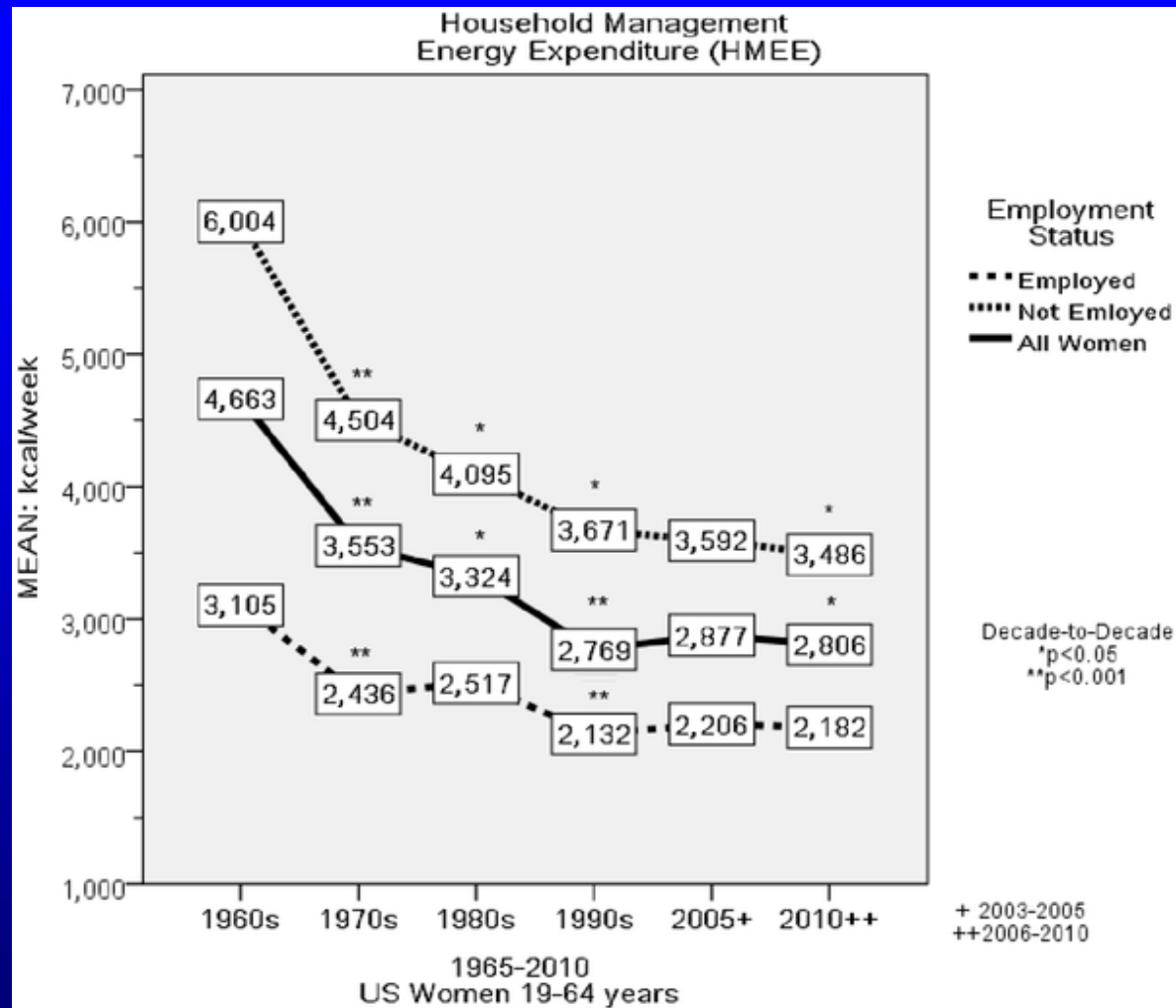


Daily Occupational Caloric Expenditure



Church TS et al. PLoS 2011

Figure 3. Household Management Energy Expenditure per Week.

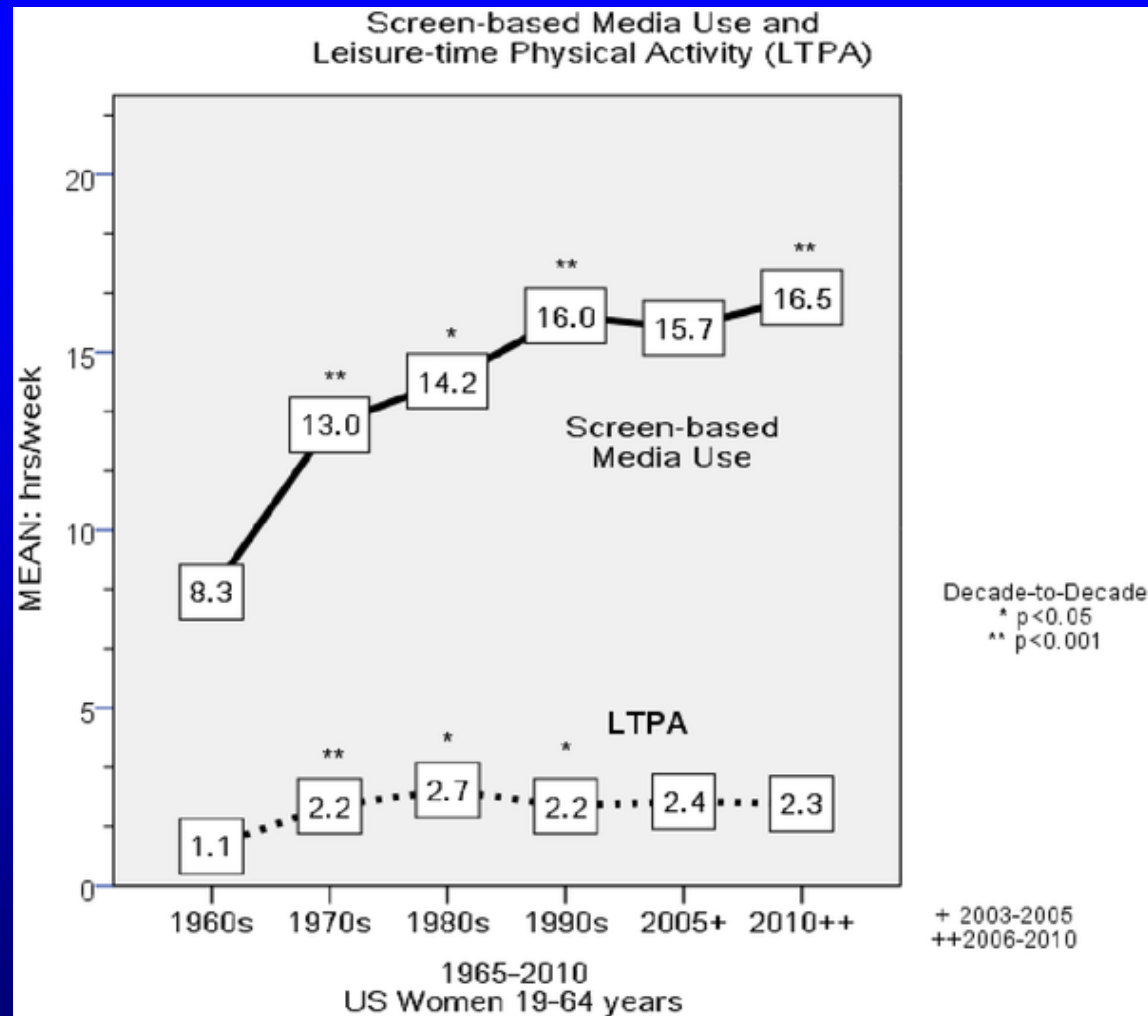


Archer E, Shook RP, Thomas DM, Church TS, et al. (2013) 45-Year Trends in Women's Use of Time and Household Management Energy Expenditure. PLoS ONE 8(2): e56620.

doi:10.1371/journal.pone.0056620

<http://www.plosone.org/article/info:doi/10.1371/journal.pone.0056620>

Figure 4. Screen-based Media Use & Leisure-Time Physical Activity.



Archer E, Shook RP, Thomas DM, Church TS, et al. (2013) 45-Year Trends in Women's Use of Time and Household Management Energy Expenditure. PLoS ONE 8(2): e56620.

doi:10.1371/journal.pone.0056620

<http://www.plosone.org/article/info:doi/10.1371/journal.pone.0056620>

Using BMI to Characterize the Obesity Epidemic

Definitions for adults

Body mass index (BMI) – weight/height ²

- Underweight: BMI < 18.5
- Normal weight: BMI 18.5-<25
- Overweight*: BMI 25-<30
- Obesity: BMI 30 +

	BMI 18.5	BMI 25	BMI 30
162 cm (64 in)	49 kg (107 lbs)	66 kg (145 lbs)	79 kg (174 lbs)
178 cm (70 in)	59 kg (129 lbs)	79 kg (174 lbs)	95 kg (209 lbs)

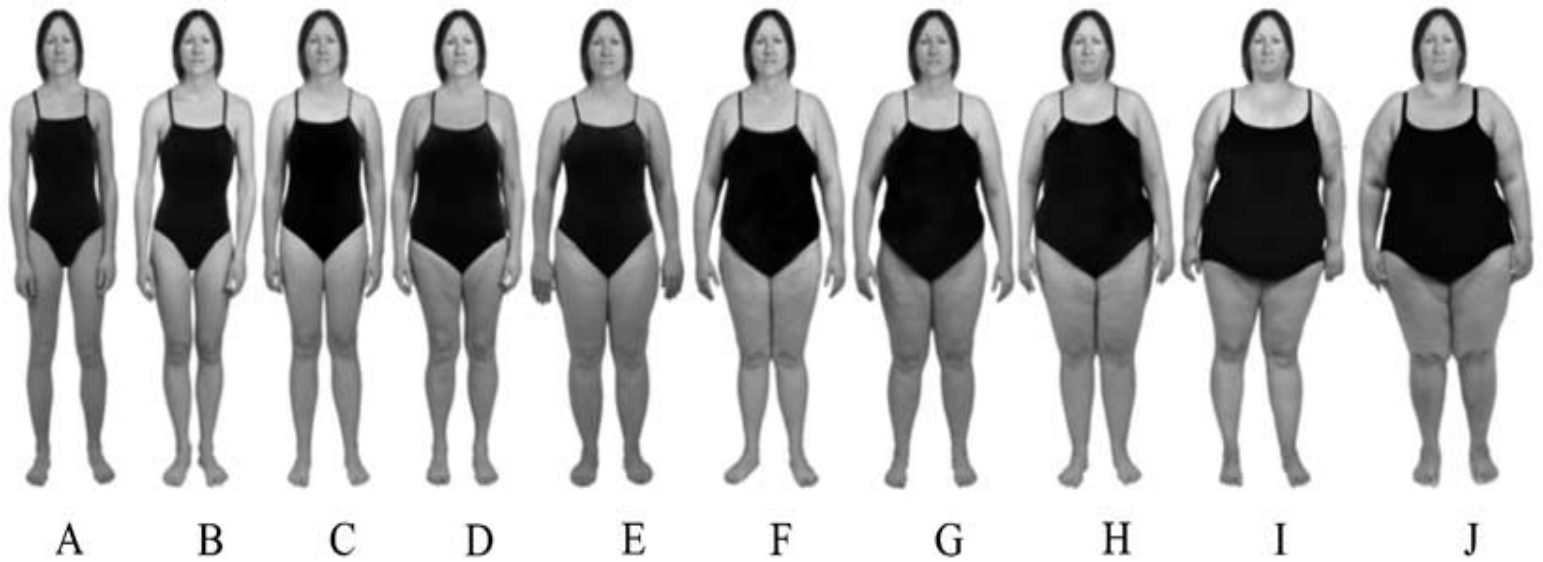
* WHO defines overweight as BMI 25+

Courtesy of Katherine Flegal



SOURCE: Harris 2008 Int J Obesity

Courtesy of Katherine Flegal



SOURCE: Harris 2008 Int J Obesity

Courtesy of Katherine Flegal



Weight by Measured BMI	Under weight	Normal weight	Over weight	Class I Obesity	Class II Obesity	Class III Obesity
Perception of Weight by Respondents	Underwt.	Normal weight	Overweight	Obese		
		Healthy				

SOURCE: Harris 2008 Int J Obesity

Courtesy of Katherine Flegal



Weight by Measured BMI	Under weight	Normal weight	Over weight	Class I Obesity	Class II Obesity	Class III Obesity
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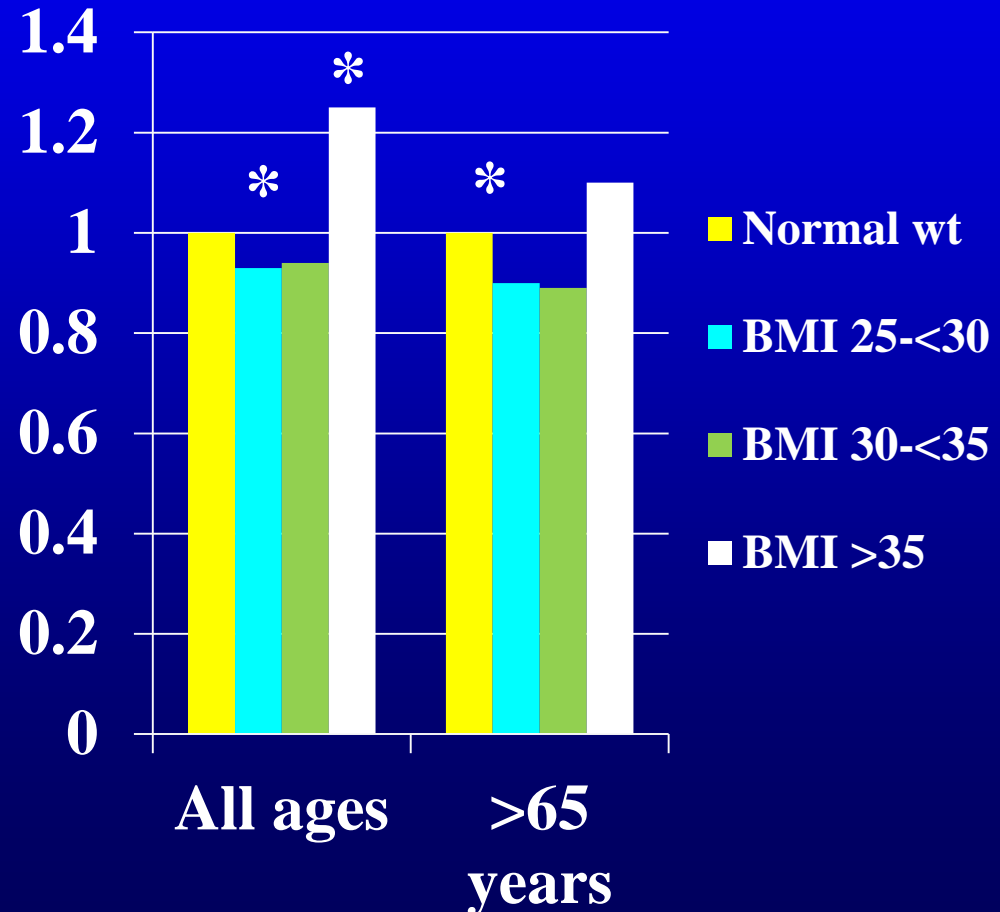
BMI and All-Cause Mortality

(Measured height and weight)

Flegal et al. *JAMA* 2013; 309:71-82

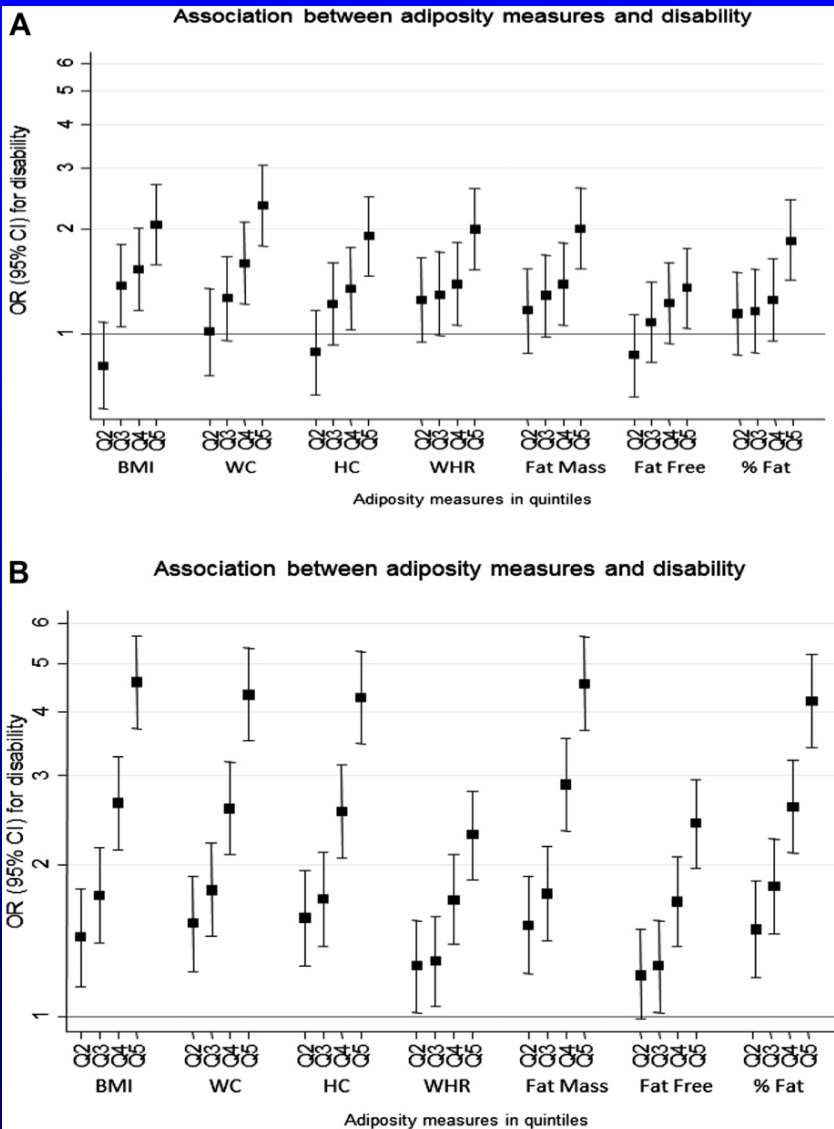
- Final selection yielded 97 articles with data on the topic
 - 2.88 million individuals
 - >270,000 deaths
- Sensitivity analyses were used to address possible over adjustment or under adjustment in the analyses

Hazard Ratio



**Can't we have a more equal focus
on physical inactivity and
obesity?**

Wong E et al. Adiposity measures as predictors of long-term physical disability. *Ann Epidemiol* 2012; 22:710-16




- Melbourne Collaborative Cohort Study of 7,142 women and men
- After 14 year follow-up, participants “were asked about difficulties performing certain activities because of their health. Activities included bathing, dressing, eating, getting out of a chair or bed, going to our using the toilet at home, and walking about 200-300 meters”.
- Physical activity or fitness was not assessed and taken into account in the analyses.

Disability and quintiles of adiposity. Men (A) and Women (B)

What Should We Do?

Learn the true causes
of the obesity epidemic!
Then develop sound
policies and strategies
to deal with it.



The Energy Balance Study



Thank you
Questions?